PARTNERS IN ENVIRONMENTAL TECHNOLOGY

SERDP Strategic Environmental Research and Development Program

ESTCP

INFORMATION B•U•L•L•E•T•I•N

WINTER 2001
NUMBER 7

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Networking was a "primetime" event at the Year 2000 *Partners in Environmental Technology* Technical Symposium and Workshop.

For event highlights, see pp. 4–5 of this issue.

Fifth Annual Technical Symposium and Workshop Ushers in the New Decade

November 28-30 marked the fifth year that SERDP and ESTCP hosted an annual Symposium together. Held in the Washington, D.C. metropolitan area at the Hyatt Regency hotel in Crystal City, the event once again successfully attracted more than 550 attendees to interact with colleagues and discuss environmental issues facing the Department of Defense (DoD) during the next 10 years.

A cast of thought-provoking speakers highlighted this year's event both during the Plenary Session on the first day as well as during the 12 technical breakout sessions that continued throughout the three-day event. Plenary Session speakers included a variety of influential and forward-looking individuals from Government and non-Government organizations that provided attendees with overviews of key environmental issues and critical paths to success over the next decade.

In her last address to this forum in her present capacity as the Deputy Under Secretary of Defense for Environmental Security, Ms. Sherri Goodman offered her assessment of DoD's future environmental dilemmas and challenged the attendees to continue the pursuit of sustainability. Dr. Jeffrey Marqusee and Mr. Bradley Smith presented Ms. Goodman with a memento recognizing her seven years of dedicated service to SERDP, ESTCP, and defense environmental programs.

From a global perspective, Mr. Greg Wetstone, Director of Programs for the Natural Resources Defense Council, shared his insights on the near-term environmental challenges facing our nation and the world. The defense environmental community recognized that, in many cases, it has a stake in the issues outlined by Mr. Wetstone.

Major General Robert Van Antwerp, Jr., the U.S. Army's Assistant Chief of Staff for Installation Management, focused on how the current and expected regulatory environment has impacted and will continue to impact future DoD installations and operations.

Dr. James M. Smith, Director of the Institute for National Security Studies at the U.S. Air Force Academy, provided an insightful overview of the anticipated environmental regulatory climate and political agendas proposed by the two presidential candidates. Further, he described how and why certain states have succeeded better than others in attaining their environmental mandates, and he highlighted the range of environmental requirements imposed by individual states on both Government and industry.

For the second year, SERDP Principal Investigators who excelled in helping DoD achieve its mission while improving environmental performance were recognized. This year, SERDP and ESTCP were honored to have Dr. Norine Noonan, Assistant Administrator for the Environmental Protection Agency's (EPA) Office of Research and Development, present the annual Project of the Year Awards. Recipients of this prestigious award included those that follow:

Cleanup/Unexploded Ordnance (UXO). Dr. Leslie Collins, Duke University, was selected for her cutting-edge work in signal processing and data fusion that resulted in a significant improvement in discrimination between buried UXO and non-UXO items. A marked reduction in false alarm rates was achieved while maintaining a high probability of UXO detection, as well as a potential for large cost savings to the DoD as it clears its lands of this potential hazard.

Compliance. Dr. Scott Bisson, Sandia National Labs, and Dr. Mengdawn Cheng, Oak Ridge National Labs, both won awards for their individual efforts to develop ultra-sensitive, laser-based air pollutant detection and monitoring devices—one for inorganic metals and one for organics. These innovative technologies provide a new ability to sample, assess, and monitor continuously both organic and metal particulate species for a variety of air emissions sources at DoD facilities.

See SYMPOSIUM, page 3

S•U•C•C•E•S•S STORIES

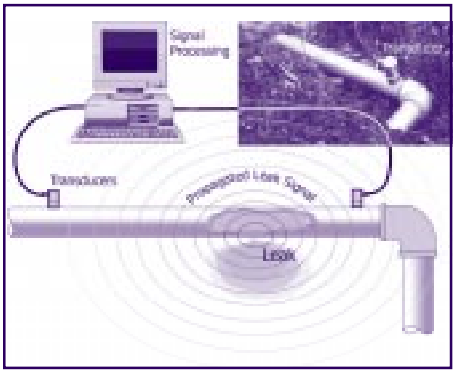
SERDP-funded research and development efforts and ESTCP-funded demonstration and validation activities continue to provide a rapidly increasing number of outstanding technical advances. These developments are highly important and relevant to the Department of Defense (DoD), Department of Energy (DOE), Environmental Protection Agency (EPA), and many other user communities.

SUCCESS STORY

ESTCP Demonstrates Effectiveness of Acoustic Sensors to Identify Leaks in Fuel Pipelines

The DoD owns more than 10,000 fuel storage tanks and associated piping networks that must be periodically monitored and tested for leaks. Contamination from such leaks must be remediated, often at a high cost to the DoD. Numerous studies have indicated that most leaks occur in pipelines, not in the tanks themselves. Currently, a number of pipeline leak detection systems meet the standards of EPA and other regulatory agencies. But while effective leak detection is possible, there is a need for a low-cost and rapid means of locating leaks. To address this situation, ESTCP is funding a demonstration/validation test of a passive acoustic online or portable monitoring system that provides real-time leak location and detection verification [CP-9904: *Advanced Passive Acoustic Leak Location and Detection Verification System (PALS) for Underground Fuel Pipelines*].

An acoustic system can be used as a large stethoscope to locate leaks and subsequently remediate them quickly with minimum cost and with significant performance, operational, and cost advantages over existing systems (e.g., tracer, cable, and vapor monitoring). The passive acoustic system is made up of three acoustic sensors, a signal conditioning system, a wireless communication system, a data acquisition and signal processing system, and a simple user interface for initiating a test and displaying results. Acoustic signals are measured at the sensors attached to the outside wall, passed through separate signal conditioning amplifier and filter components, and digitized by the data acquisition computer. A reference and velocity acoustic sensor pair, located on one side of the suspected leak, estimates the velocity of propagation of sound in the product. Position and reference sensors bracket the leak.



Acoustic sensors attached to fuel pipelines are connected via transducers to provide online leak detection.

Once knowledge of the velocity of propagation is obtained, the measurements from these two sensors provide an estimate of the distance of the leak from the reference sensor. Because passive acoustic measurement for leak location can be completed quickly (e.g., tens of seconds to several minutes), the system can be used in real time and can provide immediate operational feedback not possible with existing technologies.

To date, numerous demonstrations/validations have been conducted and deemed successful. For example, the research project team completed a demonstration/validation test at Port Hueneme on a 10-inch diameter pipeline. Numerous leak locations and instrumentation configurations with sensor separations of up to 150 feet were tested. Leaks of less than 2 gallons/hour were located within 1 percent of sensor separation distance. A demonstration/validation of the PALS system also was completed on a hydrant line under actual operational airfield conditions. The PALS was able to locate simulated leaks consistently to within 3 to 4 feet with sensors located at each hydrant pit. Airfield noise conditions did not adversely impact system operation. Furthermore, the tests showed that the simulated leaks could be detected easily at distances of more than 700 feet, which was the maximum distance between the first and last hydrant pit.

Numerous performance, operational, and cost benefits are associated with the implementation of a passive acoustic leak location system. First, it can increase facility readiness and reduce revenue loss by returning the facility to full operational status more quickly than is now possible. Second, the service life for older pipelines can be extended significantly with rapid detection and location. And third, a dramatic reduction in excavation costs will be realized with the high-precision leak location capabilities of passive acoustics. Significant savings in DoD cleanup cost avoidance also are expected. The Army Environmental Center estimates the average cleanup cost associated with tank and piping leaks to be $193,000. Cleanup costs are even higher if the groundwater is contaminated. Future cost avoidance at 659 Navy sites is estimated at $890 million.

For more information about this project, please contact Mr. William Major, Naval Facilities Engineering Center, Port Hueneme, CA, at (805) 982-1801 or via e-mail at majorwr@nfesc.navy.mil. ◆

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SUCCESS STORY

SERDP Bioremediation Project Helps to Realize Cost Savings for DoD

Army Installation Director David C. Fordham of the Badger Army Ammunition Plant (BAAP) located in Baraboo, Wisconsin, recently commended the efforts of SERDP to fund skilled and innovative researchers who effectively have utilized bioremediation as an alternative technology to clean up dinitrotoluene (DNT) contamination. New and innovative research in past years to address soil and groundwater contaminated with nitroaromatics at BAAP has culminated in an accelerated schedule for clean up of the contamination at a significantly reduced cost. To date, BAAP has benefitted from the decrease in time needed to clean up DNT from 15 to 5 years while cutting costs from $75 million to less than $10 million.

Badger Army Ammunition Plant, an Army propellant manufacturing plant, is the site of a propellant burning ground where DNT has entered the soil resulting in groundwater contamination. At one time, soil concentrations of DNT reached 27 percent. The approved remedy prior to exploration of bioremediation technologies involved removal of soil to a depth of 110 feet followed by incineration at a total cost of $75 million.

Beginning in 1995, the Army explored the possibility of bioremediation for clean up of the nitroaromatic contaminated soils and groundwaters at BAAP. An initial step involved demonstration that microbes naturally occurring in the soil at Badger were slowly destroying the DNT.

Through a SERDP-funded project led by Dr. Jim Spain and Ms. Shirley Nishino (CU-720: *Integrated Biotreatment Research Program: From Flask to Field*), work continued to develop bioremediation as a viable alternative for clean up of nitroaromatic contaminated soil and groundwater at Badger. This research,

See BIOREMEDIATION, page 7

SYMPOSIUM, from page 1

Conservation. Dr. David Helweg, U.S. Navy Space and Naval Warfare Systems Center, was recognized for his innovative efforts to understand the anatomic hearing capacity of baleen whales, as well as for developing algorithms to identify whale hot spots in naval training areas using bottom mounted hydrophones.

Pollution Prevention. Mr. Robert Katz and his research team from the U.S. Army Armament Research Development and Engineering Center accepted their award for developing a new water-reducible Chemical Agent Resistant Coating formulation in which all Hazardous Air Pollutants were completely eliminated and Volatile Organic Compounds reduced in half from 3.5 lbs/gal to 1.8 lbs/gal.

Following the Plenary Session, a two-and-one-half day technical workshop provided both stimulating presentations from acknowledged experts in their fields, as well as presentations of examples of cutting edge technological solutions for environmental matters of concern that we face today or are expected to face during the next decade. Topical areas of interest included Novel UXO Detection and Data Processing/ Integration Technologies; Strategic Pollution Prevention; Long-Term Monitoring and Optimization Techniques; Impacts of Urban Development on DoD/DOE Facilities; Detection, Monitoring, and Management of Cultural Resources; Cleanup and Ecotoxicity of Perchlorate in Groundwater; Green Chemistry; Total Environmental Cost Accounting; Sustainability of Testing and Training Ranges; Remediation and Bioavailability of Metals in Soils; and Air Emissions on DoD Installations. Most sessions were very well attended, and several were standing room only!

Of course, the Symposium was not all work. Attendees were provided several opportunities to interact with more than 110 poster presenters and capture valuable program information from 24 exhibits from a variety of Departments and Agencies. This year, exhibits were provided by the Army, Navy, Air Force, DoD, EPA, DOE, and the InterState Technology and Regulatory Cooperation. These sessions offered daily opportunities to foster networking and social exchanges.

Although not widely publicized, the Partners in Environmental Technology Technical Symposium and Workshop forum also provides meeting space (free of charge) for subgroup meetings or training events—a unique aspect of this venue. This year, the following meetings were held:

- Cultural Resources Planning
- SERDP Ecosystems Management Project (SEMP) Technical Advisory Committee
- Ecological Modeling
- Pollution Prevention Technology Thrust Area Working Group (TTAWG) Work Group
- Bioremediation Technical Advisory Committee
- Multi-Agency Perchlorate Working Group
- Advanced Bioremediation Training hosted by the InterState Technology and Regulatory Cooperation (ITRC)
- Navy SERDP/ESTCP planning

Finally, and traditionally as the last event, Dr. Marqusee and Mr. Smith provided interested researchers with an overview of the ESTCP and SERDP planning process and a short discussion of the recently released SERDP Statements of Need. This well-attended closing session continues to enlighten all who wish to seek SERDP and ESTCP funding and participate in their solicitations for research and technology demonstration projects.

The continued success of the Symposium has forced the SERDP and ESTCP staff to seek a larger facility. Next year's Symposium will move to a new location—the Marriott Wardman Park Hotel on Connecticut Avenue in Washington, D.C.—conveniently located on the Metro's Red Line. This next Symposium will be held November 27–29, 2001, and will celebrate SERDP's tenth year as a Defense Program. Be sure to mark this event on your calendar! ◆

H•I•G•H•L•I•G•H•T•S

Partners in Environmental Technology

November 28–30, 2000
Hyatt Regency Crystal City
Arlington, Virginia

Above, Deputy Under Secretary of Defense for Environmental Security Ms. Sherri Goodman discusses sustainable development initiatives within the DoD; top right, Major General Robert Van Antwerp explains the impact of the environment on his Army facilities; lower right, Dr. James Smith postulates on the potential environmental stances of the two Presidential candidates.

Above, Mr. Greg Wetstone offers insight to the Plenary Session audience on the impending environmental issues facing the world during the coming decade.

The Plenary Session offered thought-provoking messages that challenged the audience to deal effectively with environmental issues during the coming years.

Above, Ms. Cathy Vogel, left, and Dr. Elizabeth Maull prepare to join in a Cleanup technical session; top right, Mr. Chuck Pellerin and Mr. Mike Hathaway review the P2 workshop agenda; lower right, Dr. Robert Holst and Mr. Chuck Alford discuss propulsion emissions control technologies during the poster session/reception.

Above and right, display booths from 24 Federal and State organizations encouraged partnering opportunities.

TECHNICAL SYMPOSIUM AND WORKSHOP

"Environmental Challenges for the Next Decade"

Top, Mr. Ernest Lory and Ms. Karen Miller (shown with Mr. Bradley Smith and Dr. Jeff Marqusee) receive a Letter of Commendation signed by Dr. Delores Etter, DUSD(S&T), for Port Hueneme's Navy National Environmental Technology Test Site; left, Dr. Leslie Collins stands with Dr. Jeff Marqusee in front of her award-winning project/poster on UXO detection signal processing; right, Ms. Karla Armstrong (accepting for Dr. Scott Bisson) and Dr. Mengdawn Cheng proudly display their Project of the Year Award for efforts on continuous emissions detection and monitoring.

Top left clockwise, Col. John Selstrom, USAF; Dr. Brad Allenby, AT&T; Mr. George Robitaille, AEC; and Mr. Mike Osborne, NAVSEA, offer their insights and possible solutions during four of the twelve technical sessions.

Left, attendees take a break during one of two buffet meals; above and below, daily poster sessions encourage networking.

Top, Dr. Norine Noonan, EPA's Assistant Administrator for Research and Development, congratulates Dr. David Helweg as he receives his Conservation award; below, holding his award for P2 Project of the Year, Mr. Robert Katz is flanked by his CARC team in front of his poster.

PHOTOS BY CRAIG KELLSTROM

FY 2002 Program Development Process Update

SERDP

On November 9, two solicitations were released to assist in developing the FY 2002 program, one to solicit proposals that respond to the 17 Statements of Need (SON) in the "core" program and one to request proposals that are responsive to a handful of SONs for the SERDP Exploratory Development (SEED) program. Each of these solicitations included a Call for Proposals to the SERDP Federal participants and a Broad Agency Announcement (BAA) in the Commerce Business Daily (CBD) directed at the private sector. Requirements for each solicitation are different, but details can be found in the *Funding and Opportunities* section of the SERDP web site (www.serdp.org).

Initiated by Congress as a separate request, a special solicitation to both Federal and private entities was released on November 28 to request proposals against three SONs in the area of Live Fire Pollutants. Full proposals were due January 23. SERDP plans to conduct an expedited external Peer Review and Technology Thrust Area Working Group (TTAWG) review and expects selected proposals to brief the SERDP Scientific Advisory Board at its March 27-28 meeting. See the web site for additional details. Successful proposers should receive notification on this requirement by late February.

KEY OPEN SOLICITATION DATES

Solicitation	Sector	Preproposals Due	Proposals Due
"core"	Private	January 9	March 8*
(FY02)	Federal	N/A	March 8**
SEED	Private	N/A	February 8
(FY02)	Federal	N/A	February 8

* If requested by SERDP

** After having passed through each individual organization's (e.g., Air Force, DOE, etc.) review process

ESTCP

A Call for Proposals to the DoD community was released on January 10 requesting submissions on a variety of topics in four areas. On the same day, a Call for Proposals to the non-DoD/Federal sector and a CBD announcement were released as a BAA to solicit only Cleanup and UXO technologies that can respond to three topics. These topics can be found on the ESTCP web site (www.estcp.org) in the *Funding and Opportunities* section. Preproposals from the private sector and non-DoD/Federal sector are due March 15. Proposals submitted from the Federal organizations are due April 12. ◆

Dover National Test Site Hosts Visitors Day

With the primary objective of promoting collaboration among environmental researchers, the Dover (Delaware) National Test Site (DNTS), one of three National Environmental Technology Test Sites (NETTS) funded by SERDP, held a Visitors Day on August 29, 2000. Approximately 80 researchers, regulators, and elected officials participated in the event, including representatives from EPA, DOE, SERDP, and several state regulatory agencies. Programmatic briefings, technical presentations, and site tours facilitated communication among the diverse attendees who will continue to define and improve future research in the environmental field.

As a SERDP NETTS site, DNTS provides facilities and assistance for the research, development, and evaluation of environmental technologies. DNTS is the Air Force's contribution toward the advancement of innovative, cost-effective technologies focusing on the detection, monitoring, and remediation of chlorinated solvents and fuels. Chlorinated solvents represent a class of contaminants detected at more DoD sites than any other. Dover hosts the only test site in the United States with the capability to conduct controlled releases of contaminants into sealed portions of the surficial aquifer. This allows researchers to test and compare treatment technologies using very accurate mass balance calculations.

Mr. Nick DiPasquale, DNREC, provided insight into the relationship Delaware has developed with the technologies that are demonstrated at Dover NETTS.

The Visitors Day activities began with Col. S. "Taco" Gilbert III, Dover Air Force Base, 436th Airlift Wing Commander, and Col. Joseph Drobezko, 436th Support Group Commander, commending the visitors for their sensitivity to Dover's environmental restoration efforts and their continued support of program goals. Mr. Nick DiPasquale, Delaware's Secretary of the Department of Natural Resources and Environmental Control (DNREC), then provided insight into the partnership between Delaware, EPA, and DoD in further elucidating the joint efforts at work with regard to DNTS.

Following several programmatic briefings and statements regarding the role of DNTS in addressing the environmental needs of Dover, five technical presentations were provided, each focusing on core demonstrations conducted at Dover. These technical presentations were followed by tours of DNTS, including the established test cells and other test plots located in existing contaminant plumes. These tours provided an opportunity for one-on-one interactions between visitors and the Principal Investigators for several projects. Together with the other Visitors Day activities and the diverse attendees, these tours helped achieve the mission of the NETTS program—to accelerate the pace of remediation technology development and deployment through the transfer of information to other governmental and private organizations.

For more than six years, those working at DNTS have facilitated basic and applied research by streamlining the demonstration and validation process required by regulatory agencies. For more information about research efforts at DNTS, please contact Mr. Tim McHale, Dover National Test Site, Dover, DE, at (302) 677-4147 or via e-mail at timothy.mchale@dover.af.mil. ◆

PROGRAM NOTES

- **THANKS TO ALL WHO PARTICIPATED IN OR ATTENDED THE PARTNERS IN ENVIRONMENTAL TECHNOLOGY TECHNICAL SYMPOSIUM & WORKSHOP IN NOVEMBER.** The event was a tremendous success, thanks to all of your efforts. Be sure to mark your calendars for the next Symposium which will be held November 27–29, 2001, at the Marriott Wardman Park Hotel, Washington, D.C.
- **BEGIN PLANNING NOW FOR THE COMBINED SERDP AND ESTCP IN-PROGRESS REVIEWS (IPR)** which are scheduled to be held in the Washington, D.C. area during April and May. The current schedule calls for the IPRs to be held on the following dates: Pollution Prevention IPR (April 2-6); Conservation IPR (April 18–19); Cleanup IPR (April 30–May 8); UXO IPR (May 9–11); and Compliance IPR (May 15–18).

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- **FULL PROPOSALS WILL BE REQUESTED** from qualified proposers responding to the Core Broad Agency Announcement (BAA) on February 1.
- **FULL PROPOSALS IN RESPONSE TO THE SERDP EXPLORATORY DEVELOPMENT (SEED) BAA ARE DUE** to the SERDP Program Office by 4:00 p.m. EST on February 8.
- **FULL PROPOSALS REQUESTED IN RESPONSE TO THE BAA AND THE FEDERAL CALL FOR PROPOSALS ARE DUE** to the Program Office by 4:00 p.m. EST on March 8.
- **THE SERDP SCIENTIFIC ADVISORY BOARD (SAB)** is scheduled to meet March 27-28 in Arlington, Virginia. Contact Amy Kelly at (703) 696-2124 or via e-mail at kellya@acq.osd.mil for additional information.
- **PROGRESS REPORT DATA FOR THE SECOND QUARTER OF GOVERNMENT FY 2001 IS DUE APRIL 15.** For assistance, contact your Program Manager Assistant.

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- **PREPROPOSALS IN RESPONSE TO THE NON-DoD FEDERAL AND BAA SOLICITATIONS ARE DUE** to the ESTCP Program Office by 4:00 p.m. EST on March 15.
- **DoD PHASE I PROPOSALS ARE DUE** to the ESTCP Program Office by 4:00 p.m. EST on April 12.
- **QUARTERLY REPORTS FOR THE SECOND QUARTER OF GOVERNMENT FY 2001 ARE DUE APRIL 15.** For assistance, contact your Program Manager.

BIOREMEDIATION, from page 3

conducted through the Air Force Research Laboratory (AFRL) at Tyndall Air Force Base, included basic science, preliminary laboratory-scale evaluations of soil samples, and bench-scale treatability studies, and it provided the basis for application of bioremediation technologies to the Badger site. AFRL's supportive role in the remediation process at Badger has expanded to include participation in field demonstration tests and the design of the full-scale in-situ treatment plan.

In the future, the bioremediation technology potentially will be applied to a related burning ground site at the plant for an additional $60–65 million savings. Application at other ammunition plants throughout the United States will further expound the savings in time and money observed at Badger through the application of bioremediation technologies.

For additional information, please contact Ms. Cathy Vogel, SERDP/ESTCP Cleanup Program Manager, at (703) 696-2118 or via e-mail at vogelc@acq.osd.mil. ◆

PARTNERS IN ENVIRONMENTAL TECHNOLOGY

STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM (SERDP) & ENVIRONMENTAL SECURITY TECHNOLOGY CERTIFICATION PROGRAM (ESTCP)

INFORMATION B◆U◆L◆L◆E◆T◆I◆N

WINTER 2001 NUMBER 7

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Information and ideas for future articles are always welcome. Address comments, suggestions, mailing list requests, and address changes to

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FOR SERDP AND ESTCP

FEBRUARY 2001

February 1
SERDP full proposals to be requested from qualified proposers responding to the Core Broad Agency Announcement (BAA)

February 8
Full proposals due in response to the SERDP Exploratory Development (SEED) BAA

MARCH 2001

March 8
SERDP full proposals due in response to the BAA and Federal Call for Proposals

March 15
ESTCP preproposals due in response to the non-DoD Federal and BAA solicitations

March 27–28
SERDP Scientific Advisory Board meeting, Arlington, Virginia

APRIL 2001

April 2–6
Pollution Prevention In-Progress Review (IPR) meeting

April 12
ESTCP DoD Phase I proposals due

April 15
SERDP quarterly progress reports due for the second quarter of Government FY 2001

April 15
ESTCP quarterly reports due for the second quarter of Government FY 2001

April 18–19
Conservation IPR meeting

April 30–May 8
Cleanup IPR meeting

May 9–11
UXO IPR meeting

May 15–18
Compliance IPR meeting

RELATED CONFERENCES & EVENTS

February 15–20
American Association for the Advancement of Science (AAAS) Annual Meeting and Science Innovation Exhibition
San Francisco Hilton
San Francisco, CA

For additional information, visit www.aaas.org/meetings or call (202) 326-6450.

March 19–22
The Association for the Environmental Health of Soils (AEHS)—Eleventh Annual West Coast Conference on Contaminated Soils, Sediments & Water
The DoubleTree Hotel Mission Valley
San Diego, CA

For additional information, visit www.aehs.com or call (413) 549-5561.

April 9–12
UXO Countermine Forum
New Orleans Marriott–French Quarter
New Orleans, LA

For additional information, visit www.denix.osd.mil/TheForum or call 1-888-808-5303.

April 23–26
National Defense Industrial Association (NDIA)
27th Environmental Symposium & Exhibition
Austin Convention Center
Austin, TX

For additional information, visit www.ndia.org.

June 4–7
In-Situ & On-Site Bioremediation—The Sixth International Symposium
Sheraton Harbor Island Resort
San Diego, CA

For additional information, visit www.battele.org/conferences.

June 18-20
The Fourth Tri-Service Environmental Technology Symposium, *Environmental Technology: Support the Mission, Sustain the Environment*
Town and Country Hotel and Convention Center
San Diego, CA

For additional information, visit www.ets-2001.com.

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